

S4 shown in FIG. 1 or FIG. 2. The control by the higher rank mobile radio communication control station 301 or the like is not required in the synchronizing operation, thus executing autonomous synchronization among radio base stations only. When the priority of the radio base station 205 is equal to or higher than the priority of its own station, the radio base station 222 performs synchronization with the radio base station 205 notwithstanding that it is connected to the mobile radio communication control station 301 different from the own station.

When the radio base station is equivalent to a radio base station which is not a synchronizing key station even if it is a synchronizing key station and is brought to a synchronization non-established state due to reconnection of a power supply, lowering of an electric field strength and other causes in case synchronization based on priority is made, the radio base station executes synchronization establishing operation directly with another synchronizing key station or indirectly through a radio base station which is not a synchronizing key station synchronized herewith when a broadcast signal including priority information and synchronization establishing information is received directly from the other synchronizing key station or a radio base station which is not a synchronizing key station synchronized with this synchronizing key station.

For example, when a case that synchronization is made by processing in such two stages whether the radio base station is designated as a synchronizing key station or not is considered without performing synchronization based on priority, the trouble is caused that no synchronization is made indefinitely among a plurality of radio base stations which are not synchronizing key stations brought into a multizone state apart from the synchronizing key station. Like the present embodiment, however, it is possible to avoid the trouble in synchronization in the processing only in two steps whether the radio base station is designated as a synchronizing key station or not by adopting a system in which priority to respective base stations is given in advance, this priority is determined when synchronization is made, and, when the radio base station is synchronized with the remote station based on the results of this determination, the priority of the relevant remote station is taken over as it is.

A case where the service zone of a microcell is expanded gradually and a service zone which has been independent is merged into the service zone which has been expanded may be assumed. In such a case, it is possible to have radio base stations in an expanded service zone synchronize with one another after the lapse of a fixed time by performing control based on priority information from a higher rank mobile radio communication control station, a further higher rank exchange or the like by performing processing such as described above.

Due to a fact that respective contiguous radio base stations are synchronized with one another, the control for zone switching becomes easy by synchronization among radio base stations in handoff, etc. Further, even when the radio base stations of a microcell system are additionally installed one after another due to selling-off of terminals, addition of circuits is not required especially, but synchronization among the radio base stations is established autonomously and automatically. Accordingly, synchronization is surely established among radio base stations or the like located among a plurality of enterprises or around a high traffic zone, and the control of radio circuits in use of the same terminal covering houses, offices and outdoor (public) networks is made easier and more efficient.

Furthermore, it is possible to realize synchronization among respective radio base stations with very high accuracy of the order of fluctuation errors caused by the jitter of the transmitter-receiver in respective radio base stations by actually measuring required propagation time of radiowave between the radio base stations and establishing synchronization based on these actually measured values.

Besides, the present invention is not limited to the foregoing, but various modifications can be made within the scope of the gist thereof. For example, a case in which several of respective radio base stations shown with marks ▲ are designated as synchronizing key stations has been described in FIG. 9 of the above-mentioned embodiment, but it is also possible to provide mobile radio base stations 301 to 303 with a function as a radio base station and designate any of them as one of the synchronizing key stations. For example, when the power source is disconnected due to construction or the like in one of a plurality of radio base stations in a mutually synchronized state and the power source is connected again thereafter, it is also possible to incorporate in advance such algorithm as to make the priority of that radio base station the lowest. By doing so, a radio base station in which the power source is recovered shifts to a synchronized state similar to before quickly between the radio base station and surrounding radio base stations.

Further, various structures described below are applicable for shortening the period of time required for synchronization establishment between radio base stations. Those are: a structure that, while a plurality of carriers are allocated to a normal broadcast signal, the period of time required for the radio base station on the receiving side to detect the received broadcast signal is shortened by allocating a specific carrier among those carriers to the broadcast signal utilized for synchronization establishment; a structure in which only a specific radio base station such as a synchronizing key station transmits the broadcast signal for synchronization establishment; and a structure in which a repetitive period of a broadcast signal transmitted for every several frames is set to the minimum repetitive period (such as a period corresponding to a super frame in a PHP).

Furthermore, a case of the TDMA system has been explained, but the present invention is applicable not only to the TDMA system, but also to the CDMA system in point of synchronization between base stations in a small zone structure by a digital system.

I claim:

1. A method of establishing synchronization among a plurality of radio base stations forming a mobile radio communication system comprising the steps of:

transmitting from each of the radio base stations a radio control signal including priority information indicating a synchronization priority of the radio base station, and synchronization establishing information indicating whether synchronization has been established between the radio base station and any other one of the radio base stations; and

establishing synchronization in any one of the radio base stations, which is acting as a receiving base station, when the receiving base station receives the radio control signal transmitted from another transmitting radio base station, with the transmitting base station, provided that the receiving base station has not previously established synchronization, and providing that the priority information included in the received radio control signal indicates that the receiving base station is allowed to establish synchronization with the transmit-